Opportunity Analysis
for
Unit Level Ammunition Status (ULAS)

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***A** - Added **M** - Modified **D** - Deleted

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1 Executive Summary

The Marine Corps has a long history of innovation when established doctrine, policies, tactics, techniques, or procedures are inadequate to accomplish the task. These moments of insight or inspiration have been applied to tactical operations, mobility, infrastructure, equipment, and the collateral and supporting systems that sustain the operating forces, as well as the supporting establishment. Over the last twenty years, many such innovations have been recognized, and ultimately developed and deployed for Corps-wide use. This report documents the results of an Opportunity Analysis (OA) performed on the Unit Level Ammunition Status (ULAS) pilot project by the DoN eBusiness Operations Office.

1.1 The Changing Need

In 2000, following publication of *Joint Vision 2020*, an atmosphere of change was created within the Marine Corps for a full-spectrum logistics transformation. This transformation includes, but is not limited to the tactics, techniques, and procedures (TTP) used by the operating forces in order to make logistics anticipatory rather than reactive. It is an environment that uses information rather than mass to focus support to the operating forces. It was in this environment that the concept for the ULAS was incubated and nurtured.

1.2 The Target Environment

Presently, tactical commanders can only obtain a listing of available ammunition stock through brute force methods. No systems are in place to provide ready visibility of ammunition assets once they have been issued from retail supply points (reporters) to the operating forces (non-reporters). The magnitude of that potential "missing" visibility is illustrated in Figures 1 and 2.
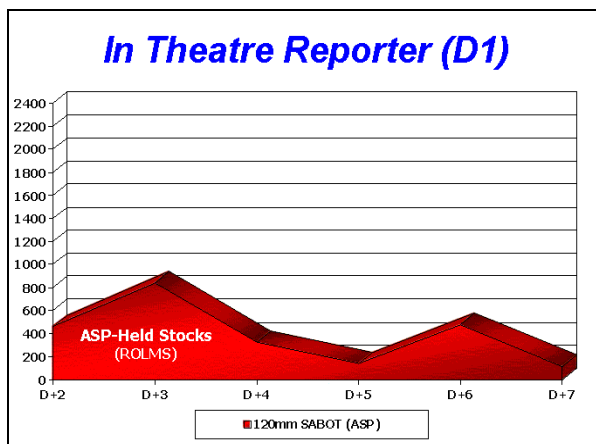
Figure 1: Stock Levels at ASP   Figure 2: Stocks Held by Forces
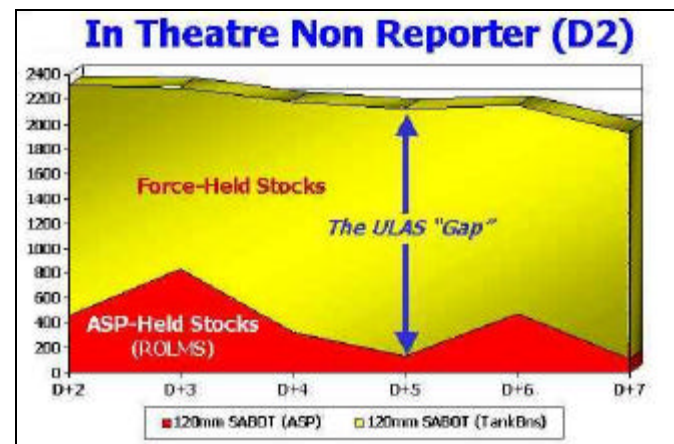
The stocks held in the ammunition supply points (ASP, or generically, a retail stock point) are tracked using an automated system called ROLMS (Retail Ordnance Logistics Management System), a system that is common to Navy and the Marine Corps, both ground and aviation. But the Service Component commander does not have direct access to this system. Instead, the commander must rely on processed information extracted from the ROLMS account. That is the information that would be "visible", as illustrated in Figure 1. Ammunition that has already been issued from the ASP to the operating forces, whether for Force Protection or basic operating stocks for combat operations, is traditionally treated as expended and thus no longer

"visible" to the commander. This creates the potential for the situation illustrated in Figure 2, where the aggregate stock level for the selected item is actually quite substantial and may even meet the unified commander's requirement. However, since the Service Component commander and subordinate commanders do not have this information readily at hand, they are compelled to react to the information they do have. This may lead to requests for additional ammunition that actually isn't needed, placing additive demands on strategic lift and organic transportation assets, possibly displacing other cargoes that are needed, and the associated manpower for handling, and storage.

1.3 The Target Problem

For a large, geographically dispersed force, the process of munitions status reporting can represent potentially several hundred man-hours of effort to collect, report, organize, analyze, and prepare the report for the commander, even for a generally linear organization. Methods of collection and reporting are as varied as the reporting units themselves, and almost all are susceptible to human error. From this large body of disparate ammunition data, the Service Component commander is also obliged to extract, synthesize, and provide a daily Munitions Status Report (MUREP) to the supported Unified Commander. This process requires additional analysis, necessitated by the MUREP's influence that extends beyond the theater of operations, reaching back to the Service headquarters, the Joint Staff, and in some cases, to National Command Authority. The manual or marginally automated methods and procedures necessarily used to collect these data, and process it into information almost guarantee that it will neither be complete (the MUREP only collects data on selected items of special interest to the Unified Commander, the Joint Staff, or the Service Headquarters) or current, but only the best available.
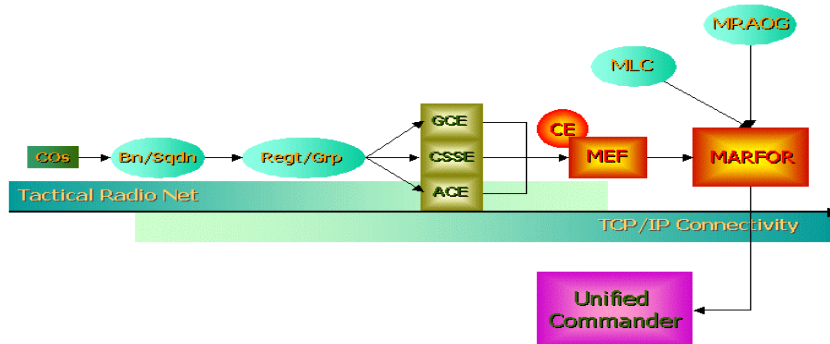
Figure 3: Notional Reporting Organization

1.4 Significance of the MUREP

The significance of the MUREP, and the difficulties and deficiencies inherent in collecting and reporting the relevant data were recently highlighted during Operation Enduring Freedom (OEF). Operational commanders did not have any clear "picture" of their ammunition status, and had limited confidence in the numbers that were reported. As these reports moved farther up the chain of command, they became less timely, and were less likely to be representative of the situation in the combatant commander's Area of Responsibility (AOR).

1.5 Ammunition Logistics Awareness

The Unit Level Ammunition Status (ULAS) project aimed at developing a capability to establish and maintain daily ammunition stock levels by individual Department of Defense Identification

Code (DoDIC) using Commercial-Off-The-Shelf (COTS) technologies. This capability must permit timely aggregation of multi-level ammunition stock status, and improve ammunition logistics situational awareness and Joint munitions status reporting (MUREP). The ULAS, as envisioned for the proof-of-concept demonstration, does not eliminate current processes. It does, however, shift the domain of those processes from labor-intensive pencil-and-paper methods to processes based on portable computing, satellite communications, and copper wire. A shift of this magnitude is not always welcomed, or readily accepted. Nevertheless, once released, the genie does not return to the lamp easily. The relative simplicity of the ULAS technology, its ease of use, its relative low cost, and its likely applicability to a wide spectrum of commodities and other resources make it a considerable alternative to current methods. If the results of two relatively successful demonstrations in the austere environmental conditions of the Marine Corps Air Ground Combat Center (MCAGCC) at Twentynine Palms CA are factored in, the case for applicability of the technology to ammunition and potentially to other commodities grows stronger.

1.6   The Future of The ULAS Technology

The future of the ULAS technology is undetermined as of this writing. A number of short-term opportunities present themselves, and are described in paragraph 6 of this report. There is no pretense that the technology is anything other than interesting, and thought provoking. However, if the results reported herein generate that interest, or provoke new thinking about how to solve persistent logistics reporting and situational awareness challenges, then the development and demonstrations will have served much of their purpose. Among the considerations in ULAS' development were the general and specific requirements detailed in the CINC-129 Requirements document (originally published Sep 2001, and updated in Jan 2002). The ULAS addresses, in whole or in part, elements of Requirements 11, 13, 14, 20, 41, 62, 80, and 85 from that document, as they pertain to Class V ammunition. In that context, the simplicity of the technology and its use, and its relative low cost make it worthy of further assessment and evaluation as either a candidate solution, or an interim solution until a more universally applicable technology is developed and deployed enroute to the fully capable Global Combat Support System (GCSS) contemplated in the CINC-129 Requirements.

Further information about this, and other DoN eBusiness Operations Office projects, may be obtained through our website at http://www.don-ebusiness.navsup.navy.mil.

2   Project Description and Background

As described in the preceding paragraphs, no systems or standardized procedures presently exist to enable the commander to establish visibility of ammunition assets held by the operating forces once issued from the Ammunition Supply Point (ASP). When ammunition is issued from the accountable record, it is essentially treated as "expended".

2.1   Business Problem Satisfied by the Pilot

Numerous directives already exist requiring the unit receiving the ammunition items to maintain custody, to store it safely under temporary field conditions, and to provide for its physical security. At the end of the tactical operation or training exercise, the unit is required to return unused materiel to the ASP, and separately provide an expenditure report to their chain of command. These processes are entirely manual at the unit level, are predominantly local implementations (and thus, not standardized), and are susceptible to human error. The purpose of the ULAS proof-of-concept was to identify a candidate technology that provided a capability

to establish ammunition visibility below the retail level. Collaterally, the candidate technology needed to provide the commander with the ability to aggregate multi-level unit ammunition details for internal (logistics), and external (Joint Munitions Status Report (MUREP)) reporting purposes. Ideally, the candidate technology should also be capable of being demonstrated in as rigorous an environment as possible, short of combat operations. An ongoing series of Combined Arms Exercises (CAX) is conducted at the Marine Corps Air Ground Combat Center, Twentynine Palms, CA, and provided just such a venue. Accordingly, a CAX was selected as the ULAS test bed.

2.2 Current System or Process

The current process for collection, aggregation, and reporting of ammunition status is predominantly manual. At the small unit level (battalion and below), it might take the form of "yellow canaries" (an informal handwritten message form), a notebook sheet, scraps of paper, or use of voice media such as radio and tactical telephones. At each succeeding level of command, the process becomes more complex due to the need for aggregation of the reports from multiple subordinates, and includes the assets for self. At these levels and higher some automation exists in the form of spreadsheet applications, primitive database applications, and in at least one instance, a DOS-based application. All of these systems suffer from the same liability however; there is no capability to electronically report assets into these systems. All inputs are manually processed and analyzed in the context of the application the data are stored in. In similar fashion, reporting out from these systems is also essentially manual since there are no formal interconnections with other logistics support tools.

2.3 Description of Pilot System

Simply described, the general premise of the ULAS tool is to use an application hosted on a Portable Electronic Device (PED – also commercially referred to as a PDA, or Personal Digital Assistant)) to collect and manage logistics information in a standardized structure. When reporting is to be performed, the Marine activates a reporting utility function on the PED. This action prompts the Iridium modem to contact the nearest satellite and establish communications. When the channel is established, the utility continues with user verification, transmission of the data file, and acknowledgment of receipt, using a Secure Socket Layer (SSL) instance. When the file has been transferred and acknowledged, a command is issued to the PED to terminate the connection. And finally, after the connection is terminated, the application performs housekeeping tasks on the transactional data, retaining the last reported quantity on hand for any future transactions to be processed.
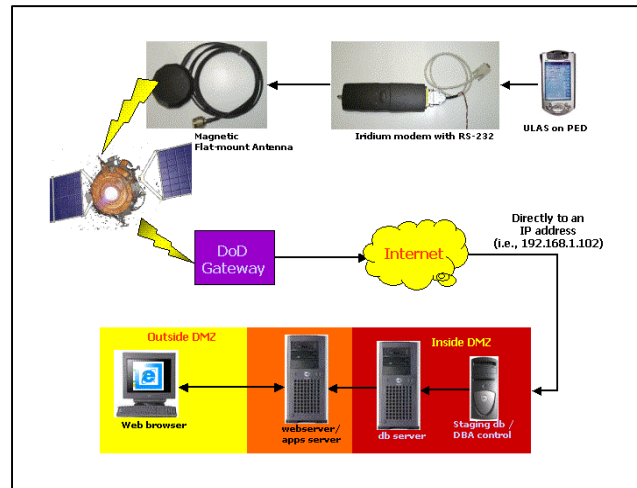

Figure 4: ULAS Pilot Process

2.4 Technical Architecture

From a more technical perspective, the ULAS development may be generally represented as

shown in Figure 5. Using Pocket PC 2002 as the PED operating system, and SQL Server CE as the database, the application provides a means to record and process the unit's ammunition data. When reporting is initiated, the file is created and encrypted, and the application uses the Iridium modem to communicate with the DoD Gateway via the Iridium satellite constellation. From the Gateway, the traffic is delivered via standard internet-based protocols to a web server running Microsoft's Internet Information Server. The web s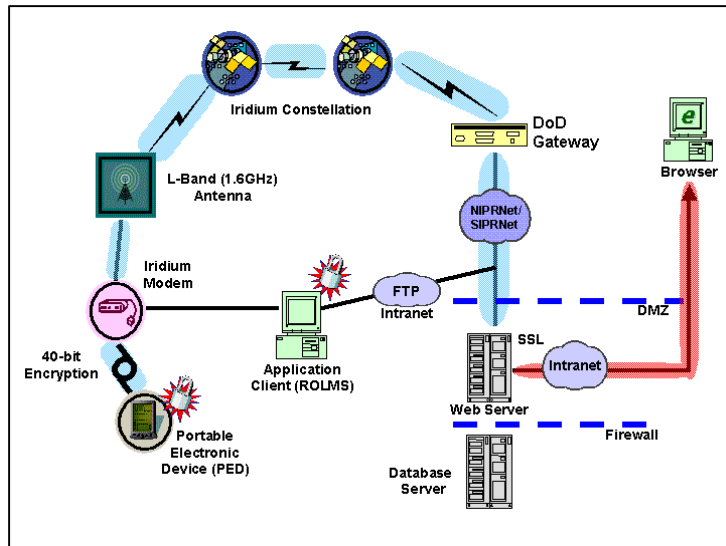erver processes the file and passes it to the database server running SQL Server 2000, where the file is decrypted and the individual records inserted into the database. Both servers were running Windows 2000 Advanced Server as the operating system. When the file has been processed, the data are then accessible via an authorized user's web browser. The types of information available to the user was controlled using a Secure Sockets Layer (SSL), and the methods available for acting on that information were controlled by defined user roles.

Figure 5: ULAS Technical Architecture

3 Project Goals, Objectives and Metrics

A detailed discussion of the project's goals and objectives, and the metrics against which attainment of those goals and objectives could be measured and evaluated would be incomplete without acknowledging a principal fact: everything that ULAS is intended to accomplish can, in fact, already be done. But the processes and methods currently in place are predominantly or exclusively manual, are manpower-intensive, and difficult to consistently achieve the levels of accuracy that would justify the investment of time and energy to accomplish the task. The ULAS was designed to make the process and procedures more efficient, more responsive, and significantly more accurate than current methods.

3.1 Project Goals and Objectives

The goals for the ULAS Pilot Project were to demonstrate that it is technically feasible to accurately establish and maintain ammunition asset visibility at levels below retail, and that the collected data, combined with information from accountable records, may be used to provide a wide array of ammunition logistics information for the commander. It was also the intent to demonstrate a capability to extract and report information that is relevant to the Unified Commander's Munitions Status Report (MUREP). The ULAS Pilot Project objectives were to reduce the time required to collect and present ammunition asset information, standardize the methods and processes involved in collection of the information, and as a derivative objective, to extract relevant information for preparation of the Service Component commander's portion of the MUREP.

3.2 Project Metrics

ULAS Pilot Project metrics were harder to define than might have otherwise been the case because many of the current processes ULAS would supplant are and will continue to be performed by uniformed personnel, and have never been objectively measured in terms of time, cost, or value added. Concurrently, while there have been efforts at imposing standardization through policy and directives issued from time to time, local preferences are still superimposed on the core policy, sometimes limiting or negating the desired effects of the directive.

3.2.1 Ammunition Asset Visibility

Establishing ammunition asset visibility after the materiel has been issued to the operating forces is almost exclusively a manual, time-consuming, labor-intensive, process that is susceptible to human error. Additionally, each major command has its own locally devised methods to obtain the desired degree of visibility. Our metric then, was to determine if ammunition asset visibility could be efficiently established and readily maintained, using standardized methods and procedures to produce verifiable results.

3.2.2 Time Required to Collect the Reports

Using the current manual methods to collect and process ammunition asset information consumes many hours, or even days, for geographically dispersed organizations. The relevance and reliability of the numbers diminishes with time, adversely affecting the commander's confidence in the reported values. Our metric then, was to establish a near real-time reporting capability that provided the commander with confidence that the reported values reflected the status of ammunition assets throughout the organization.

3.2.3 MUREP Accurately Reflects Relevant On-Hand Assets

Recent experience with Service Component-level Munitions Status Reporting (MUREP) during Operation Enduring Freedom was less than ideal. Among the complications was inability to consistently visualize ammunition assets issued to or held by the operating forces. In addition, the MUREP format that presently exists in the CJCS Manual 3150.14A required only minimal data, insufficient on which to base major logistics or operational decisions in a timely manner. The Joint Staff recognized these deficiencies and proposed a new format (shown at Figure 6) requiring significantly more information than the previous versions of the report. Our metric then, was to create a properly formatted MUREP, with appropriately populated fields, that correctly represented the relevant reported assets.

MUREP Data Elements

| A | B | C | Begin Balance | | E | F | G |
			D1	D2			
Munition	DoDIC/ NALC	Reqmt	Reporter	Non-Reporter	Receipts	Cmbt Rel Exp	Other Exp

| H | I | J | K | L | Due Ins | | | N |
					M1	M2	M3	
End Bal	Total Exp	Exp Per Day	7-Day Exp Rate	On-Hand DOS	1-10 Days	11-20 Days	Greater than 21	Est Cap

| Inventories | | | | | | | | | Readiness |
O1	O2	O3	O4	O5	O6	O7	O8	O9	P
CONUS	(STAMP)	LantFlt	PacFlt	Prepo	CENTCOM	PACOM	EUCOM	WW	Rqmt

Figure 6: Revised Munitions Status Report

3.3 Alignment of Pilot and Enterprise Goals

The goal alignment table in Figure 7 illustrates how the enhanced capabilities offered by the

ULAS system directly contribute to the satisfaction of enterprise goals and objectives.

Enterprise Goals & Objectives (Critical Success Factors)	Pilot-Enabled Capability	Key Performance Indicators (Metrics)
Establish/maintain total force ammunition asset visibility	Enabled electronic reporting at the unit level and web-based retrieval and analysis at the higher headquarters levels	• Standardized processes and methods established • Asset visibility established electronically • Automatically updated as reports received
Enable near real-time reporting of ammunition status and provide the commander with situational awareness	Overall time from unit report, aggregation and analysis, to data availability at the Force Commander level reduced from 12+ **hours** (or longer) to 6 _minutes_ or less	• Enabled near real-time reporting • Automated aggregation of unit reports • Displayed results and analysis in a web-enabled format
Produce the Service Component commander's Joint Munitions Status Report (MUREP)	Automated production of a correctly populated Service Component MUREP in the new format using web-based technologies	• Correctly populated Service Component MUREP • Presented in a web-enabled format

Figure 7: Goal Alignment Table

4   Analysis of Pilot Results

In general terms, the ULAS Pilot Project and proof-of-concept successfully demonstrated that a technology could be developed and applied to achieve the stated goals and objectives. As with any new technology, there were elements that need more maturing, and equipment improvement. Within the available time and resources, the project successfully achieved the desired results. The actual proof-of-concept results are summarized in the following paragraphs.

4.1   Evaluation of Metrics

A discussion of how well the ULAS proof-of-concept demonstration met the stated and implied objectives, and where deficiencies were identified, is detailed in the following paragraphs.

4.1.1   Improved Ammunition Asset Visibility

At the customer's recommendation, data entry operations for the proof-of-concept were scripted. An example unit script is located at Appendix B. The basic concept of operations was for each assigned Marine to represent a unit type that was analogous to the units exercising during the on-going CAX. Each "unit" was assigned a pre-determined list of Department of Defense Identification Codes (DoDIC) against which they would process receipts and expenditures on a daily basis. Each day's quantities were predetermined, enabling the test team to track which units reported. It also enabled the team to verify the accuracy of the reported quantities (expected versus actual). Summarized results are displayed in Figure 8:

Available Reporters	Day 0	Day 1	Day 2	Day 3	Average
Fielded Units	10	10	10	10	10
Operating Units	10	10	8	7	8.8

Reported Records	Day 0	Day 1	Day 2	Day 3	Totals
Expected Records	88	88	148	87	421
Actual Records	88	76	118	56	338
Correct Records	88	75	113[1]	54	328

Percent Correct	100%	98.7%	95.8%	96.4%	97.0%

[1] The five (5) incorrectly reported values appear to be the sum of non-reported values from the previous day, plus scripted values for the current day. On that assertion, adjusting the percentage of correct records would result in values of 80/81 (*98.8*%) correct for Day 1, and 116/118 (*98.3*%) correct for Day 2.

Figure 8: Daily and Overall Reporting Results

Overall, the results were as good, or better, than might otherwise have been expected from inexperienced personnel using a new technology. While not perfectly accurate, the test results confirmed that the Marines adapted quickly to the technology with minimal training, did not require any specialized skills, and could report a high percentage (with the adjustments reported in Note 1 above, the overall average increases from 97% to 98.4%) of their records accurately. In fact, many observers and participants in the development and testing of the ULAS have remarked on it being design-biased in favor of ammunition personnel, whereas the design concept was exactly the opposite: design a system simple enough for any Marine to use, regardless of military specialty. For the proof-of-concept demonstration, five of the assigned Marines were, by chance, ammunition personnel, and the other five were from other occupational specialties. It is worthy of note that the Marine who proved to be most adept at learning and using the ULAS technology was a Light Armored Vehicle Turret Repairman (in fairness, it is also noted that this Marine has previously been socialized to similar technologies and devices used within his primary military duties, in the form of diagnostic and maintenance support equipment.) The results also confirmed that incorrect reports could be detected and isolated for corrective actions as appropriate. On a subjective scale ranging from zero to five, with five being most successful, we rate this objective as a five.

4.1.2 Reduced Time Required to Collect the Reports

One of the significant deficiencies in current methods is the time required to collect, aggregate, analyze, and report on the data being provided by operating force units. There are many dependencies, not the least of which is having reliable communications. As units begin to operate farther and farther afield from their parent commands, the methods and reliability of their communications is diminished, and the time required to complete the communication is frequently measured in hours, and sometimes days. With the ULAS technology providing an extremely reliable means of communication for reporting from almost anywhere in the world, the timeliness of any required reporting is vastly improved. By using standardized processes and procedures on both the PED and the back-end server, aggregation of all the unit-level reports is done automatically as reports are received. Using the ULAS, a task that might take 12-plus hours or more to complete at the Service Component commander's level under current methods, can be reduced to a matter of minutes, and with substantially improved accuracy and timeliness. During the proof-of-concept demonstration, we experienced data turnarounds of approximately eleven-plus minutes after receipt of last report. With some adjustments, that time

cycle was reduced to approximately six minutes during the LTA. These results suggest that the potential exists to enable a commander to make *anticipatory* logistics decisions, acting on current information that is aged *less than one hour*. On a subjective scale ranging from zero to five, with five being most successful, we rate this objective as a five.

4.1.3 MUREP Accurately Reflects Relevant On-Hand Assets

The project team evaluated the system's ability to generate the reports specified in the system design documents, using the field-input data generated by the PED users as its primary source. The project team also used these reports as a means to establish that the PED users were, in fact, submitting unit-level reports as directed, and that the values were the expected values. The estimation of the project team is that designated reports were accurately generated, to include the MUREP, for items identified for the test as MUREP-reportable. However, the validity of the values reported in the MUREP was not fully examined during the proof-of-concept demonstration. Subsequent to the ULAS proof-of-concept demonstration during CAX 10-02, the Ammunition Logistics staff of Marine Forces Pacific (MFP), in concert with the MFP Experimentation Center - Ammo Logistics Focus Team (MEC-ALFT) formally requested conduct a Limited Technical Assessment (LTA) of the ULAS. Whereas the intent of the original proof-of-concept demonstration was to determine if the technology could perform the expected tasks, the purpose of the LTA was to evaluate the potential for the ULAS to satisfy operational objectives to improve situational awareness and ammunition visibility on the modern battlefield. It was determined that the next best opportunity for a LTA under dynamic and demanding conditions was during CAX 1-03, also at MCAGCC Twentynine Palms, CA. A more detailed examination of MUREP outputs was conducted during the LTA, conducted in October 2002, and is discussed below.

4.1.3.1 Limited Technical Assessment (LTA)

The general scenario called for providing ULAS user training to a designated group of Marines participating in the CAX, turn the equipment over to the Marines, and have them conduct ammunition reporting on actual ammunition assets and expenditures from their units while the CAX was underway. The data thus reported were transmitted to the ULAS website where they were processed for command-level reporting and analysis via a web browser. A concurrent objective was to evaluate population of the Joint Munitions Status Report (MUREP) for submission by the Service component commander.

4.1.3.2 Population of MUREP Data Fields

Processing that occurred following the first days' unit level reporting cycle revealed that while the correct fields of the MUREP were being populated by the application, an error existed in the internal business logic that was treating "Transfers" between retail supply activities (the ASP) and the operating forces were being treated as "Other Expenditures" (as compared to "Combat Expenditures"). This creates a situation where the overall theater inventory is decremented by the amount of the transfer(s). At low initial stock levels, potential exists for the system to report a larger combined expenditure than the total available theater assets. This resulted in negative numbers appearing in the report, an illogical state. Once identified, it was determined that the source of the problem required a complex correction to the code. To avoid interrupting the assessment that was in progress, we applied a temporary corrective measure by artificially adding new assets into the ASP account in amounts equal to the decrements attributed to the error. This temporarily cured the problem so that the assessment could continue and other critical elements could be adequately evaluated. Since the problem was readily identifiable, and corrected at the conclusion of the LTA, we rated this objective as a four.

4.1.4 Overall Assessment of the Results

The radar chart shown in Figure 9 summarizes the overall results of the pilot, in terms of the recorded metrics. This graphic plots each of the three ULAS project metrics along an axis with values ranging from a low of zero to a high of five. A value of zero indicates that the applicable goal was not achieved, while a value of five represents a goal that was fully attained. Intermediate scores portray a range of performance between the two extremes, with values of three and above generally being indicative of success.
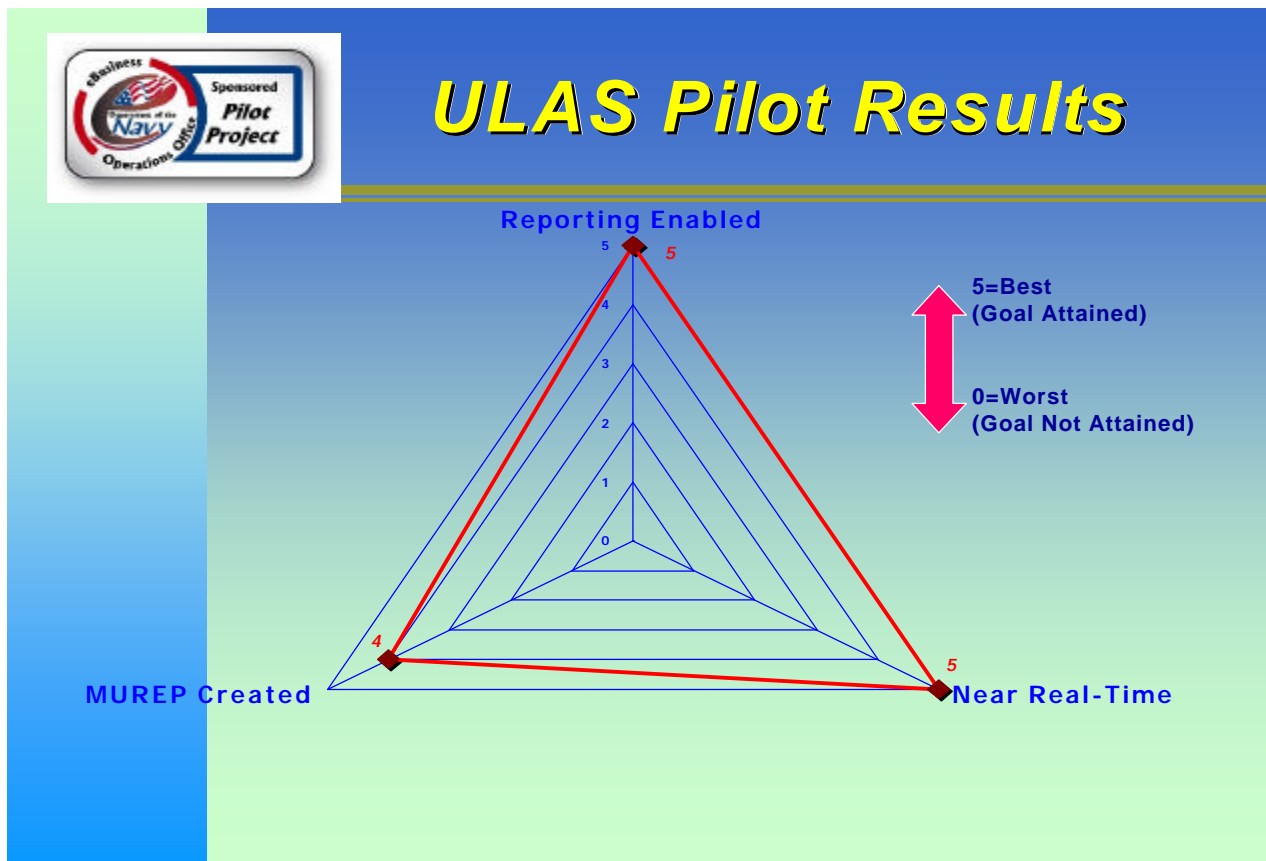
Figure 9: ULAS Metrics Radar Summary

4.2 Qualitative Analysis and Intangible Benefits

As has been noted elsewhere in this document, the qualitative aspects of the ULAS Pilot Project were perhaps more easily described than the quantitative, primarily because there were no formal measurements of the current methods to work from. In the absence of any formal systems or standardized procedures to facilitate the process, the manpower costs to achieve marginally useful results was accepted as a "cost of doing business". Workload planning at each echelon was arranged to accommodate this cost of business, precluding work on other tasks that would otherwise have commanded some attention. However, even without formal data to work from, some reasonable estimates of time and effort required to accomplished basic munitions reporting tasks can be made for the purposes of comparison. These estimates, and their net effect when compared to more recently measured events during the ULAS proof-of-concept demonstration and the subsequent LTA, are depicted in the two tables following. The improved accuracy provided by the ULAS, and the actionable conditions that are created by

virtue of its providing near real-time visibility of ammunition assets are considered intangible improvements that cannot be adequately measured, and are not included in the costs and savings described in Figures 10 and 11.

4.3   Cost-Benefit Analysis and ROI

Description	FY02	FY03	FY04	FY05	FY06	TOTAL
Cost of Pilot System						
Hardware	$174,936	$0	$0	$0	$0	$174,936
Labor						$0
CACI	$687,929	$0	$0	$0	$0	$687,929
Other Contractor Support	$70,135	$0	$0	$0	$0	$70,135
Government (Civilian & Military)	$22,776	$0	$0	$0	$0	$22,776
Subtotal Labor	$780,840	$0	$0	$0	$0	$780,840
Software	$1,214	$0	$0	$0	$0	$1,214
Subtotal Non-Recurring Costs	***$956,990***	***$0***	***$0***	***$0***	***$0***	$956,990
Recurring System Life Cycle Maintenance, Operations & Support (Projected)	$0	$60,000	$61,200	$60,000	$61,200	$242,400
Total Annual Pilot System Costs	**$956,990**	**$60,000**	**$61,200**	**$60,000**	**$61,200**	**$1,199,390**
Cumulative System Costs	**$956,990**	**$1,016,990**	**$1,078,190**	**$1,138,190**	**$1,199,390**	**$1,441,790**

Figure 10: Development & Life Cycle Support Costs

Description	FY02	FY03	FY04	FY05	FY06
Business Operations Costs for Munitions Reporting Processes					
Current Manual Process					
180 MUREP Per Year	180	180	180	180	180
Average # Man-hours per MUREP	143	143	143	143	143
Total Man-hours Required	25,740	25,740	25,740	25,740	25,740
Average Hourly Pay Rate (Unburdened)	$15.60	$15.99	$16.39	$16.80	$17.22
Total Annual Cost	***$401,479***	***$411,516***	***$421,804***	***$432,349***	***$443,158***
Average Labor Cost Per MUREP	$2,230	$2,286	$2,343	$2,402	$2,462
ULAS Capability					
180 MUREP per Year	180	180	180	180	180
Average # Man-hours per MUREP	34.25	34.25	34.25	34.25	34.25
Total Man-hours Required	6,165	6,165	6,165	6,165	6,165
Average Hourly Pay Rate (Unburdened)	$15.60	$15.99	$16.39	$16.80	$17.22
Total Annual Cost	***$96,158***	***$98,562***	***$101,026***	***$103,552***	***$106,141***
Average Labor Cost Per MUREP	$534	$548	$561	$575	$590
Benefits/Savings					
Annual Gross Productivity Savings Using ULAS	$305,321	$312,954	$320,778	$328,797	$337,017
Cumulative Gross Productivity Savings Using ULAS	$305,321	$618,274	$939,052	$1,267,849	$1,604,866
Cumulative System Costs	$956,990	$1,016,990	$1,078,190	$1,138,190	$1,199,390
Cumulative Total Net ULAS Savings	***($651,669)***	***($398,716)***	***($139,138)***	***$129,659***	***$405,476***

Figure 11: Five-Year ULAS Cost Benefit Analysis

5 Pilot Lessons Learned

The ULAS Proof-of-Concept development and demonstration provided a number of lessons learned. These are:

*   Immediately engaging the targeted customer or intended user of the new technology in the development effort up front ensures that their needs, perceived and actual, are clearly articulated and understood. This can have a substantial mitigating effect on elements of risk with exploratory projects of this nature.

*   The Iridium modem technology, combined with a Portable Electronic Device, was demonstrated to be an extremely robust medium for quick communications from almost anywhere in the world.

*   The infantry battalion, and similar sized units or smaller units operating independently, can be provided with a lightweight ability to communicate their logistics or operational information to command elements for information or action as appropriate.

*   Collecting and reporting only Essential Elements of Information (EEI) on the PED, and reserving the lion's share of the analytical work to the server can generate significant efficiencies. These efficiencies are manifested most obviously in the user's perception of simplicity of the tool, and in conservation of battery life, an important logistics consideration. Intuitively, since the ULAS, as designed, works outside the tactical data network it should also create potential for a net _decrease_ in demand on tactical bandwidth, albeit a small decrease.

*   The premise for DoN eBusiness initiatives is to examine new technologies, or old technologies newly-applied, to address known DoD deficiencies on a short-term, low cost, high potential return on investment basis. However, this research & development-centric business model, while innovative, is foreign to the standard practices applied by most DoD contracting officers. In the case of the ULAS project, this divergence caused seven _weeks_ of delay between the availability of funds and the contract award.

*   When coupled with delays in contract award, aggressive test schedules that are set by agencies external to the project can vector the developer into design decisions that may be less-than-ideal.

6 Future Opportunities and Next Steps

The Unit Level Ammunition Status pilot fulfilled the expectations of both the DoN eBusiness Operation Office and PM-Ammunition, Marine Corps Systems Command by attaining the established project goals and ultimately producing a viable ammunition status reporting capability at the unit level. It has been observed at nearly every presentation of the ULAS tool and the underlying technology that, while the ULAS was designed around ground ammunition, the fundamental mechanisms for data collection, reporting, data processing and analysis, and final presentation to authorized users in a browser-based interface are commodity-agnostic. In essence, the technology that makes ULAS work effectively can be applied to almost any DoD commodity that requires a similar level of visibility, or timeliness of information, on the basis of which the commander could make better-informed decisions.

Despite this success, the ULAS capability, as it currently exists, cannot be implemented without further modification. The extent of future examination or assessment of the cross-spectrum functional utility of the ULAS technology is unknown, at least, for the immediate future. The project team acknowledges this is an immature platform requiring some yet-to-be-determined

level of investment and advanced development in order to deploy a robust, sustainable, capability multiplier for the operating forces. Such modification is to be expected when utilizing a rapid application development (RAD) methodology, and is in fact, an integral part of the development process.

6.1   Personnel Utility

Another possible application within the DoD community that has been discussed is the utility of the technology for personnel status reporting, post-combat status reporting, or mustering of reserve personnel, when activated. Any or all of these potential applications, and others as they may come to some user's attention, are within the realm of technically feasible applications.

6.2   Other Applications

Certainly, a number of other potential applications of this technology suggest themselves, both within and outside the DoD. The special operations and intelligence communities may have uses for it as a human-intelligence collection and reporting tool, as well as Customs, Treasury, FBI, and other overt or covert law enforcement operations. It may also have utility for Homeland Security operations conducted by these agencies, or others as may be created from time to time for this purpose.

6.3   Other Assessment Opportunities

The Marine Forces Pacific Experimentation Center (MEC) has recently formed a Logistics Command and Control Focus Team (LogC2-FT) to examine logistics transformation issues, and is establishing a similar team for ammunition logistics transformation issues (ALFT). During the course of the next 12-18 months (beginning FY03), these Focus Teams will be examining the multitude of Logistics Command and Control issues facing the operating forces, and that will require some level of transformation to achieve the envisioned efficiencies. The most significant known events are: the mini-CAX conducted in Hawaii in support of CG III MEF (Okinawa, JA) and the 1st Marine Brigade (MCB Hawaii); and, an annual Joint Exercise known as Cobra Gold, conducted in Thailand. Potential also exists for insertion of the ULAS technology, primarily as a "sensor", into the CROC '03 exercise.

6.3.1 H-CAX (WESTPac and Hawaii-based Forces)

Follow-on assessment of the ULAS technology could embrace other commodities and/or personnel, to evaluate the types of data required to establish the appropriate Essential Elements of Information (EEI) required for reporting. The H-CAX exercise performed by III MEF forces in Hawaii would be one appropriate venue in which to evaluate the technology's applicability to the other commodities. With the ULAS technology's applicability to ammunition already established, it should be a reasonably uncomplicated process to apply it to many of the other commodities in which the commander has an operational or logistic interest.

6.3.2 Cobra Gold '03 (US, Thailand, and Singapore)

The Cobra Gold series of Joint exercises are designed to train both US and Thai forces to work in a combined force environment. Among the likely components of the Cobra Gold exercise are a partial offload of an MPF ship, bringing containers into the theater of operations, and may include elements of sea-based logistics. Here, the ULAS technology could be examined in terms of integrating scanning operations in the data collection and reporting process, as well as its utility for tracking and establishing visibility of containers and their contents.

6.3.3 CROC '03 (US and Australia)

The CROC '03 Joint exercise combines US and Australian forces in a combined logistics support exercise. This exercise would expose the ULAS to a multi-national reporting regime with mixed security levels, and differing management requirements.

6.4 Necessary System Enhancements

The pilot prototype clearly demonstrated the capability to quickly and efficiently report unit level ammunition status. The system will provide Marine Corps commanders with a management tool far superior to the current manual system. In addition to the modifications suggested by the pilot participants, the DoN eBusiness Operations Office recommends that ULAS explore a few supplementary enhancements.

- Incorporate the battery and Iridium modem into one unit and miniaturize units. Extend battery life and find alternate power sources.

- Move programs to a Type 1 compact Flash Card (CF-1).

- Exploit the scanner capability for the PED.

6.5 Action Plan

- Collaborate with internal Marine Corps organizations, socializing them with the ULAS technology and explore the possibility of inserting this technology into programs of record.

- Evaluate the recent Naval Construction Force (NCF) eBusiness initiative to determine the feasibility of utilizing tactical radios as the communications piece, or as a backup, in lieu of Iridium services.

Appendix A – ULAS General Business Rules

1.   The following general business rules were developed and affirmed by Marine Corps operating force representatives to guide development of the ULAS capabilities.

From a Security perspective, Windows-type authentication can take place on any web-enabled desktop/laptop that has a NIPRNet/SIPRNet connection and opens the ULAS web-based application. Using the Lightweight Directory Access Protocol (LDAP)-style approach, access will be restricted to authenticated users. Authentication will occur on the server. The handheld devices will not have a "live" connection through which to perform an on-line authentication, so we chose the following approach:

The UserID will consist of the DoDAAC for the unit. This will create a 6-character UserID. The password will consist of a minimum of 8 characters, also alphanumeric. (When the handheld device is initialized, a table will be created from the server that contains the known UserIDs, and the system-assigned passwords.)

To start the ULAS application on the handheld device, the Marine must enter a known UserID and the corresponding password to access the ULAS functions. If one or both elements are incorrect, access is denied.

If UserID/password pair is correct (matches the entries in the stored table), the Marine is allowed to access all local ULAS functions and perform reporting.

Assuming the Marine has correctly logged in to the ULAS application on the handheld, the following elements guide the procedural operations on the handheld device.

100% accuracy in user-level reporting is desired but not required. Some tolerance of inaccurate reporting is acceptable (allowable variance, or margin of tolerance is not yet defined or quantified), except for items of critical low-density or high risk (Stingers, AT-4s, etc.).

No negative values will be permitted. Any value used in a calculation that would result in a negative value (new "On Hand Qty"<0) will be challenged. The user will be returned to the screen to modify the entries until the result is equal to or greater than zero (0).

Entries that result in a new "On Hand Qty" of _exactly_ zero (0) will be permitted without challenge.

Time Sequencing

Current planning by the operating forces allows a 2-hour window between reporting echelons for the current manual or semi-automated reporting procedures. That is, the subordinate unit must report its ammunition information at least 2 hours before the next echelon must make their report to a higher headquarters. To complement the established "battle rhythm", a 24-hour clock must be defined. Our planning has the day starting at 0001 GMT, and ending at 2400 GMT.

In the military, each time reference point is given an alphabetic designation that is equivalent to (and in some cases, the same as) the phonetic alphabet used in communications (i.e., a=alpha, b=bravo… etc.). Greenwich Mean Time, or GMT, is commonly referred to as "Zulu" time, and represented as 2359Z, providing both a time and longitudinal reference point.

Given those conditions, and assuming that the Service Component Commander (MARFOR) will be required to provide his MUREP data to the Unified Combatant Commander (formerly, CINC) not later than 2200Z, the following sequencing example would apply:

MEF-CE will report not later than 2000Z (auto-release at 2001Z, controlled by comparing time-stamps of previous and current record when more than one record exists.) This is the only echelon of command where a "release" function, or an auto-release, has been retained. Data from all other organizations will be available when processed by the server.

MLC, MRAOG, and other dispersed units organizationally assigned at the MARFOR-level will also report not later than 2000Z.

The Division, Aircraft Wing, and FSSG will report not later than 1800Z.

The Regiment or Aircraft Group, the Ammunition Company FSSG, and the Ammunition Company MLC would report not later than 1600Z.

The Battalion or Squadron, and any other ancillary units that are not reported elsewhere, would provide their reports not later than 1400Z.

When reporting has been completed and reviewed, and the MARFOR's MUREP data has been sent to the Unified Combatant Commander, the system should archive the previous day's reports.

The Battalion or Squadron using the handheld device may encounter situations where communication fails, or they are otherwise precluded from reporting. In this case, the system should retain the last received report, and "flag" the unit report as "aged" when older than 24 hours. This will alert the next higher headquarters to the non-report and allow them to determine appropriate measures.

The calculation for determining when a unit report has "aged" more than 24 hours will be based on the established MARFOR report time.

Report Layouts: The conceptual report presentations to the screen are described below.

Aggregation of asset quantities will occur at the following levels:

All DoDICs

"Combat Usable" (Ready-for-Issue (RFI)) / "Not Combat Usable" (Not-Ready-for-Issue (NRFI))[1]

"Combat Usable" (Ready-for-Issue (RFI)) quantities will be determined using the Condition Code criteria established by CJCSM 3150.14, rather than the more restrictive policies of the Service, to promote consistency in MUREP reporting.

"Not Combat Usable" (Not-Ready-for-Issue (NRFI)) quantities will be determined using the Condition Code criteria established by CJCSM 3150.14A (to include provisions for the inadvertent appearance in theater of Condition Code V materiel), rather than the more liberal policies of the Service, to promote consistency in MUREP reporting.

All MUREP-designated items (RFI only)

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[1] *"Combat-usable" (CU), for the purposes of MUREP, is explicitly considered to be munitions in condition codes A, B, C, E, K, and N. The Services, however, traditionally have a differing, and somewhat more restrictive, definition of materiel that is deemed to be suitable for "combat use". By extension, materiel in Condition Codes D, F, G, H, J, L, M, and P must be considered as "not combat usable". (Condition Code V was not yet implemented at the time the CJCS Manual was staffed and published; although it is unlikely that condition code V materiel would arrive in theater, the possibility cannot be excluded and thus, materiel in this condition code should also be considered as "not combat-usable".)*

Aggregation of gross tonnages will occur in the following categories:

Tonnages by Quantity-Distance Class (QDC)
Tonnages by Controlled Item Inventory Code (CIIC)
Tonnages by Storage Compatibility Group (SCG)

Aggregation of total dollar valuation will occur at the following level:

Dollar Value by TSI (both RFI and NRFI)

All DoDICs (self, non-ROLMS). Each reporting unit should be able to display the results of their report, inclusive of data (less ROLMS data) reported by subordinate units, for their own awareness. This report should be presented as a list or table with the individual DoDICs arrayed as the left column, in DoDIC sequence. The TSI will be presented as the next column. The following column will contain the quantities for that DoDIC/TSI combination, displayed as "Combat Usable" (Ready-for-Issue (RFI) assets.

All DoDICs (self, with ROLMS - MARFOR, MEF, MLC, FSSG, WING). Each headquarters unit that controls an organic ROLMS capability should be able to display a separate report of their ROLMS-based data for their own awareness. This report should be presented as a list or table with the individual DoDICs arrayed as the left column, in DoDIC sequence. The TSI will be presented as the next column. The following two columns will contain the quantities for that DoDIC/TSI combination, one for "Combat Usable" (Ready-for-Issue (RFI) assets, and one for "Not Combat Usable" (Not-Ready-for-Issue (NRFI) assets.

All DoDICs (self, ROLMS sites). Each ROLMS reporting unit should be able to display the results of their report. This report should be presented as a list or table with the individual DoDICs arrayed as the left column, in DoDIC sequence. The TSI will be presented as the next column. The following two columns will contain the quantities for that DoDIC/TSI combination, one for "Combat Usable" (Ready-for-Issue (RFI) assets, and one for "Not Combat Usable" (Not-Ready-for-Issue (NRFI) assets.

All DoDICs (self and subordinates). Layout would be same as for "self, non-ROLMS", but would include separate tables for each of the first tier subordinate units.

All MUREP-designated items (MEF, MLC, and MARFOR only, self). Same layout as for "self", above. This report will only include items designated as Munitions Report (MUREP) items, and only for RFI quantities.

Gross tonnage and related logistics data should be available to any reporting unit for self, and be inclusive of the values for all subordinate reporting units, to include ROLMS sites. Aggregation of gross tonnages will be presented as follows:

Quantity-Distance Class (QDC), data arrayed with QDC values down the left side, and six columns representing RFI and NRFI values respectively for:

Short tons, per QDC
Measured tons, per QDC
Net Explosive Weight (in lbs.), per QDC

Tonnages by Storage Compatibility Group (SCG), data arrayed with SCG values down the left side, and six columns representing RFI and NRFI values respectively for:

Short tons, per SCG
Measured tons, per SCG
Net Explosive Weight (in lbs.), per SCG

Tonnages by Controlled Item Inventory Code (CIIC), data arrayed with CIIC values down the left side, and six columns representing RFI and NRFI values respectively for:

Short tons, per CIIC
Measured tons, per CIIC
Net Explosive Weight (in lbs.), per CIIC

Aggregation of total dollar valuation will occur at the TSI level for "self" and is inclusive of subordinate units (to include ROLMS sites) (generally, the MARFOR and Service HQ would be the only organizations with a specific interest in this report.) The TSI will be arrayed down the page in the left column. The dollar value for all RFI assets grouped under that TSI should appear in the next column, and all NRFI assets grouped under that TSI in the third column.

Report Operations: Reporting operations from the handheld device are documented elsewhere in this document, primarily in paragraph 6.a. They are however, structured simply and are oriented to data collection rather than data analysis. The browser-based interface is a much richer environment. In order to create an intuitive workflow for the browser-based ULAS interface, as well as assist in control of the reported data, the following operational sequence is postulated.

Self: After logging in to ULAS successfully, the first unordered list option presented to the user should be the form allowing for data entry of ULAS-type data. All cataloged DoDICs should be listed, with entry cells for collection of "Qty O/H", "Cbt Exp", "Oth Exp", "Trxfd", and "Rcvd".

When data entry is complete, the user should be able to scroll through the entered values to verify accuracy.

When user is satisfied that data entries are correct, click on-screen "Submit" button. This action should submit all DoDIC-level values for the unit to the staging database. Delivery to the server will also set the date-time stamp for that unit. (When the new report values are processed to the main database, the previous report's values should be sent to a Transaction History.) On receipt of acknowledgment that the report has been received, the user will command a return to the main (or, menu) screen for other options, if required.

From the main (menu), user should be able to select one or more logistics reports (described earlier), if desired, that are applicable to this unit.

Any and all reports should provide a feature to return users to the main (menu) screen, allowing them to continue, or exit the application.

Self, and Subordinate Units: After logging in to ULAS successfully, the first unordered list option presented to the user should be the form allowing for data entry of ULAS-type data. All cataloged DoDICs should be listed, with entry cells for collection of "Qty O/H", "Cbt Exp", "Oth Exp", "Trxfd", and "Rcvd".

When data entry is complete, the user should be able to scroll through the entered values to verify accuracy.

When user is satisfied that data entries are correct, click on-screen "Submit" button. This action should submit all DoDIC-level values for the unit to the staging database. Delivery to the server will also set the date-time stamp for that unit. (When the new report values are processed to the main database, the previously reported values for this unit should be sent to a Transaction History.) On receipt of acknowledgment that the report has been received, the user will command a return to the main (or, menu) screen for other options, if desired/required.

From the main (menu), user should be able to select one or more logistics reports (described earlier), if desired, that are applicable to this unit, and are inclusive of all subordinate units (in "read-only" mode).

Alternatively, from the main (menu), the user should also be able to select logistics reports that provide separate information for his unit, and each of the first tier subordinate units (direct reporters).

Any and all reports should provide a feature to return users to the main (menu) screen, allowing them to continue, or exit the application.

Self, Subordinate, and Adjacent Units ("adjacent" units allowed to FSSG/MLC only): After logging in to ULAS successfully, the first unordered list option presented to the user should be the form allowing for data entry of ULAS-type data. All cataloged DoDICs should be listed, with entry cells for collection of "Qty O/H", "Cbt Exp", "Oth Exp", "Trxfd", and "Rcvd".

When data entry is complete, the user should be able to scroll through the entered values to verify accuracy.

When user is satisfied that data entries are correct, click on-screen "Submit" button. This action should submit all DoDIC-level values for the unit to the staging database. Delivery to the server will also set the date-time stamp for that unit. (When the new report values are processed to the main database, the previously reported values for this unit should be sent to a Transaction History.) On receipt of acknowledgment that the report has been received, the user will command a return to the main (or, menu) screen for other options, if required.

From the main (menu), user should be able to select one or more logistics reports (described earlier), if desired, that are applicable to this unit, and are inclusive of all subordinate units (in "read-only" mode).

Alternatively, from the main (menu), the user should also be able to select logistics reports that provide separate information for his unit, and each of the first tier subordinate units (direct reporters).

In the case of the FSSG/MLC, there will necessarily be two "layers".

In addition to being able to select reports that depict his subordinate units, the FSSG should also be able to view the high-level reports for the Division or Aircraft Wing (in "read-only" mode).

For the one or more ROLMS sites managed by the FSSG, the Ammunition Company, Supply Battalion, FSSG exercises administrative and operational control over the ammunition accounting operations managed by ROLMS.

For the one or more ROLMS sites managed by the Aircraft Wing, the Marine Aviation Logistics Squadron (MALS), Marine Aircraft Group, Marine Aircraft Wing exercises administrative and operational control over the ammunition accounting operations managed by ROLMS.

Any and all reports should provide a feature to return users to the main (menu) screen, allowing them to continue, or exit the application.

ROLMS operations are significant to both the Force commander, and the Service HQ, in maintaining retail level *accountability* of ammunition in the theater. It is the system of record for the Marine Corps and the Navy. ULAS will assist in establishing *visibility* of ammunition assets at all levels. The ROLMS account has a substantial amount of data that are relevant to ULAS operations that must be extracted for storage and analysis, and for preparation of the MUREP.

Extraction of ROLMS data for submission to ULAS should occur prior to processing of the ROLMS Daily Transaction Report (DTR). It is envisioned that the method of extraction will be in the form of an Oracle browser query, or series of queries. The file resulting from the browser query(ies) must be transmitted to

the ULAS server.

For ROLMS sites with a reliable TCP/IP connection, the file will be transferred to the ULAS server via FTP, or other acceptable means. (Current methods for generation and submission of the DTR do not include provisions for encryption of the data, and the maximum classification of the ROLMS system is Confidential.) The file extracted for ULAS should be encrypted prior to transmission. Classification level of the extracted file has not yet been established by Service policies. (Pending final determinations, the Aircraft Wing ROLMS sites should be handled in the same manner.)

For ROLMS sites without a reliable TCP/IP connection, the file will be transferred using the Iridium modem directly from the ROLMS PC, from the serial port on the computer, and the telephony software including with the PC's operating system. The file extracted for ULAS should be encrypted prior to transmission. Classification level of the extracted file has not yet been established by Service policies. (Pending final determinations, the Aircraft Wing ROLMS sites will be handled in the same manner.)

Once the file has been transmitted, ULAS reporting from the ROLMS site is complete, and regular ROLMS reporting operations begin.

Regiment/Group and MEF/Other: Use the same methodology as for "Self, and Subordinate Units". The MEF commander will be the entity that identifies to the ULAS those DoDAACs that are to be identified as "reporters" (by implementing changes to the organizational table), and will re-assign DoDAACs as required to reflect the current organization.

MLC: Use the same methodology for "Self, Subordinate and Adjacent Units" applied to the FSSG. The MARFOR commander will identify to ULAS the DoDAACs that are designated as "reporter" and "adjacent" for the MLC.

MARFOR: Use the same methodology as for "Self, and Subordinate Units".

We envisioned that the nature of interest in ammunition status, situational awareness, and interest in MUREP values differed at each organizational level. (See Fig 1). We have attempted to characterize the type and nature of interest at each level, as detailed in the text below:
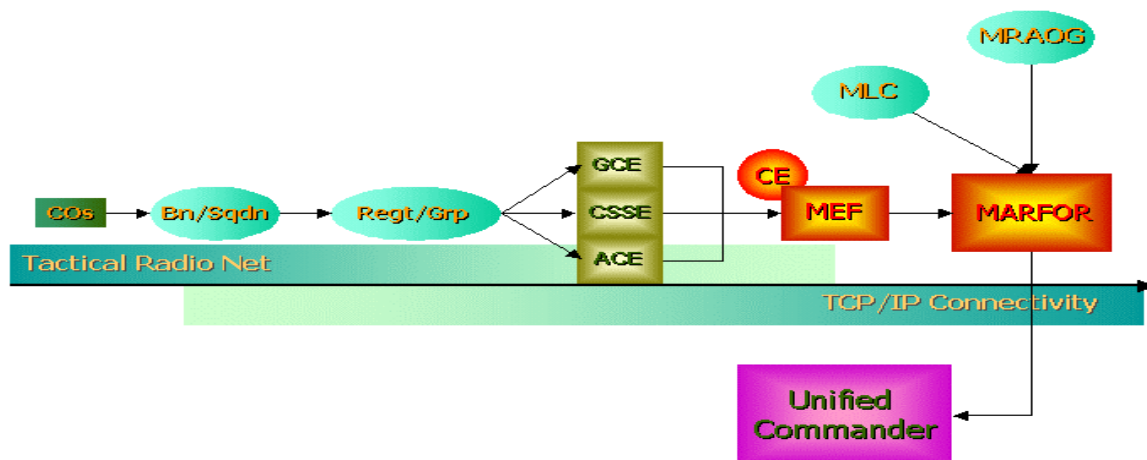
a. **Battalion/Squadron Logistics Chief**

The commander's need is for situational awareness. Data stream from this level will satisfy elements B and D-2 initially, and B, D-2 and F in all subsequent reports for the MUREP requirement. (The cited elements refer to the proposed "new" MUREP format, not the version currently listed in the CJCS Manual.)

At the Battalion/Squadron level, and below, the unit will use the ULAS (or the ULAS browser-based interface) to collect information on its Combat Expenditures, Other Expenditures, Transfers, and Receipts. At or before a designated reporting time, the unit will connect the handheld device to the Iridium modem, connect the antenna, start the ULAS and send their report. (If using the browser-based interface, the unit will assemble the report and submit.) Once the report is received by the server, and acknowledged, the server will terminate the connection (if from the handheld device) and the unit will continue operations, as required. Reporting is complete.

DoDIC-level Receipts, Other Expenditures, and Transfers will be stored for analysis (and "situational" reporting).

DoDIC-level Combat Expenditures and Qty On Hand values will be stored for analysis (and "situational" reporting). Additionally, these values will be used in preparing the MUREP for columns B, D-2, and F, only.

b. **Regimental/Group Logistics Officer**

The commander's need is for situational awareness. Data stream from this level will satisfy elements B and D-2 initially, and B, D-2, and F in all subsequent reports for the MUREP requirement.

At the Regiment/Group level, the unit will use the ULAS browser-based interface to collect information on its own Combat Expenditures, Other Expenditures, Transfers, and Receipts. At or before a designated reporting time, the unit will assemble and submit their report. Once the report is received by the server, and acknowledged, the unit may continue ULAS operations, or resume normal operations, as required. Reporting is complete.

DoDIC-level Receipts, Other Expenditures, and Transfers will be stored for analysis (and "situational" reporting).

DoDIC-level Combat Expenditures and Qty On Hand values will be stored for analysis (and "situational" reporting). Additionally, these values will be used in preparing the MUREP for columns B, D-2, and F, only.

c. **Division/Wing/FSSG Logistics Staff**

The GCE, ACE, and CSSE commanders' interest is situational awareness. The data stream at this level will satisfy elements B, D-1, and D-2 initially, and B, D-1, D-2, F, and G in all subsequent reports for the MUREP requirement.

Concept (Div): At the Division level, the unit will use the ULAS browser-based interface to collect information on Combat Expenditures, Other Expenditures, Transfers, and Receipts experienced by the Command Element, or headquarters. At or before a designated reporting time, the unit will assemble and submit a consolidated report for its own transactions. Once the report is received by the server, and acknowledged, the unit can continue ULAS operations, or resume other operations, as required. Reporting is complete.

DoDIC-level Receipts, Other Expenditures, and Transfers for the Division and its subordinate units will be stored for analysis (and "situational" reporting).

DoDIC-level Combat Expenditures and Qty On Hand values for the Division and its subordinate units will be stored for analysis (and "situational" reporting). Additionally, these values will be aggregated for use in preparing the MUREP for columns B, D-2, and F.

Situational awareness reports for the Division and its subordinate units will be available to the Division headquarters at all times, and in "read only" form by the FSSG headquarters for planning purposes.

Concept (Wing):   At the Aircraft Wing level, the unit will use the ULAS browser-based interface to collect information on Combat Expenditures, Other Expenditures, Transfers, and Receipts experienced by the Command Element, or headquarters. At or before a designated reporting time, the unit will assemble and submit a consolidated report for its own transactions. Once the report is received by the server, and acknowledged, the unit can continue ULAS operations, or resume other operations, as required. Reporting is complete.

DoDIC-level Receipts, Other Expenditures, and Transfers for the Aircraft Wing and subordinate units will be stored for analysis (and "situational" reporting). All assets under authority and control of the Service Component Commander are presumed to be of interest to that commander.

DoDIC-level Combat Expenditures and Qty On Hand values for the Aircraft Wing and its subordinate units will be stored for analysis (DoDICs with a Type Service Indicator (TSI) of "M" are only relevant to the Marine Corps ICP level. Other Service or National ICP may express a future interest in items marked with TSI other than "M".) DoDICs marked with a TSI of "M" will be aggregated for use in preparing the MUREP for columns B, D-2, and F, only. Values for all other TSI will not be included in Marine Corps totals for the MUREP, in consonance with the revised MUREP instructions.

The Aircraft Wing also operates one or more ROLMS clients to perform ammunition management functions, generally in the MALS. The ROLMS is the primary system for Marine Corps and Navy for ammunition accounting and reporting. The ULAS is designed not to interfere with ROLMS operations. The ULAS will need to extract relevant information from the ROLMS client prior to running the ROLMS Daily Transaction Report. These data will populate the ULAS and provide a more complete picture of the commander's logistics footprint for situational awareness.

Situational awareness reports for the Aircraft Wing and its subordinate units will be available to the Wing headquarters at all times, and in "read only" form by the FSSG headquarters for planning purposes.

ROLMS-based data for items with a TSI of other of than "M" will not be used to populate the MUREP. For items with a TSI of "M", the ROLMS-based data generated by the Aircraft Wing will populate columns B, D-1, and G of the MUREP.

Concept (FSSG):   At the FSSG level, the unit will use the ULAS browser-based interface to collect information on Combat Expenditures, Other Expenditures, Transfers, and Receipts experienced by the Command Element, or headquarters. At or before a designated reporting time, the unit will assemble and submit a consolidated report for its own transactions. Once the report is received by the server, and acknowledged, the unit can continue ULAS operations, or resume other operations, as required. Reporting is complete.

DoDIC-level Receipts, Other Expenditures, and Transfers for the FSSG and its subordinate units will be stored for analysis (and "situational" reporting). All assets under the authority and control of the Service Component Commander are presumed to be of interest to that commander.

DoDIC-level Combat Expenditures and Qty On Hand values for the FSSG and its subordinate units will also be stored for analysis (DoDICs marked with a TSI of "M" are only relevant to the Marine Corps ICP level. Other Service or National ICP may express a future interest in items marked with TSI other than "M".) DoDICs marked with a TSI of "M" will be aggregated for use in preparing the MUREP for columns B, D-2, and F. Values for all other TSI will <u>not</u> be included in Marine Corps totals for the MUREP.

The FSSG also operates one or more ROLMS clients to perform ammunition accounting functions, generally in the CSSD/CSSE (Ammunition Company). The ROLMS is the primary system for both the Marine Corps and Navy for ammunition accountability and reporting. The ULAS is designed not to interfere with the operations of the ROLMS site. The ULAS will, however, extract relevant information from the ROLMS client prior to running the ROLMS Daily Transaction Report. These data will be used to populate the ULAS and provide a more complete picture of the commander's logistics footprint for situational awareness.

Situational awareness reports for the FSSG and its subordinate units will be available to the FSSG headquarters at all times.

ROLMS-based data for items with a TSI of other of than "M" will <u>not</u> be used to populate the MUREP. For items with a TSI of "M", the ROLMS-based data generated by the FSSG will populate columns B, D-1, and G of the MUREP.

d. **MEF Logistics Staff**

The MEF has the *initial* interest in MUREP, as well as its own situational awareness. All subordinate data streams are aggregated at this level to provide the MEF commander with information required to manage re-supply operations, and support the JS MUREP-reporting requirements imposed on the supported Unified Combatant Commander.

Concept (MEF): At the MEF level, the unit will use the ULAS browser-based interface to collect information on Combat Expenditures, Other Expenditures, Transfers, and Receipts experienced by the Command Element, or headquarters. At or before a designated reporting time, the unit will assemble and submit a consolidated report for its own transactions. Once the report is received by the server, and acknowledged, the MEF can continue ULAS operations, or resume other operations, as required. Reporting is complete.

Situational awareness reports for the MEF commander or his subordinate units will be available to the MEF headquarters at all times. At or before a time designated by the MARFOR, the MEF will review the data submitted by subordinate units. When satisfied that the reports accurately reflect the MEF's activity for the previous 24-hour period, the MEF headquarters will "release" the time-stamp controls on the data and make it available to higher headquarters for additional analysis and review. In the absence of an affirmative "release" by the designated reporting time, the data will be automatically released by the system. (This is the only echelon of command where the "release" functionality, or auto-release, has been retained. Data for all other subordinate organizations will be available for viewing immediately after processing on the server.)

The data stream coming to the MEF from the GCE, ACE, and CSSE commanders will satisfy elements B, D-1, and D-2 initially, and B, D-1, D-2, F, and G in all subsequent reports for the MUREP requirement.

e. **MARFOR Logistics Staff**

The MARFOR level of the organization has the *primary* interest in MUREP, as well as its own situational awareness. All subordinate data streams support the establishment and maintenance of situational awareness for the commander, as well as the JS MUREP-reporting requirements imposed on the supported Unified Combatant Commander. The data stream at this level will satisfy all remaining elements of the Theater-level MUREP that are relevant to the Marine Corps.

Concept (MARFOR): The MARFOR will use the ULAS browser-based interface to collect information on Combat Expenditures, Other Expenditures, Transfers, and Receipts experienced by the Command Element, or headquarters. At or before a designated reporting time, the unit will assemble and submit its own report, and produce all reports required by the commander for situational awareness. Once the report is received by the server, and acknowledged, the unit can continue ULAS operations, or resume other operations, as required. Reporting is complete.

Based on the values input by the MARFOR, and the aggregation of values submitted by the subordinate units (Div, Wing, FSSG, MEF-CE, MLC, and MRAOG) for elements E, F, and G, the total values for MUREP elements D-1, D-2, H, I, J, K, L, and N will be calculated.

Concept (MRAOG): The MRAOG Command Element will use the ULAS browser-based interface to collect information on Combat Expenditures, Other Expenditures, Transfers, and Receipts experienced by the Command Element, or headquarters, (mirroring the process used by the Regiment/Group level organization). At or before a designated reporting time, the unit will assemble and produce all reports required by the MARFOR commander for situational awareness. Once the report is received by the server, and acknowledged, the unit can continue ULAS operations, or resume other operations, as required. Reporting is complete.

DoDIC-level Receipts, Other Expenditures, and Transfers will be stored for analysis (and "situational" reporting).

DoDIC-level Combat Expenditures and Qty On Hand values will also be stored for analysis (and "situational" reporting). These values will be aggregated for use in preparing the MUREP for columns B, D-2, and F, only.

Concept (MLC): The operations of the MLC component of the MARFOR are essential to establishing and maintaining ammunition visibility at point of entry into the theater. At the MLC level (organizationally and structurally, the MLC is nearly identical to the FSSG, but provides a different set of services to the Force), the unit will use the ULAS browser-based interface to collect information on Combat Expenditures, Other Expenditures, Transfers, and Receipts experienced by its Command Element, or headquarters. At or before a designated reporting time, the unit will assemble and submit a consolidated report for its own transactions. Once the report is received by the server, and acknowledged, the unit can continue ULAS operations, or resume other operations, as required. Reporting is complete.

DoDIC-level Receipts, Other Expenditures, and Transfers for the MLC and its subordinate units will be stored for analysis (and "situational" reporting). All assets under the authority and control of the Service Component Commander are presumed to be of interest to that commander.

DoDIC-level Combat Expenditures and Qty On Hand values for the MLC and its subordinate units will also be stored for analysis (DoDICs marked with a TSI of "M" are only relevant to

the Marine Corps ICP level. Other Service or National ICP may express a future interest in items marked with TSI other than "M".) DoDICs marked with a TSI of "M" will be aggregated for use in preparing the MUREP for columns B, D-2, and F. Values for all other TSI will <u>not</u> be included in Marine Corps totals for the MUREP.

The MLC also functions as the in-theater General Support logistics agent for the Marine Service Component Commander, and provides Direct Support to the FSSG of the MEF. The MLC will operate one or more ROLMS clients to provide ammunition accounting functions in support of Reception, Staging, Onward Movement and Integration (RSO&I) of all ammunition intended for Marine Corps forces in the theater, irrespective of its origin (from MPF, MSC charter or contract sealift, commercial shipping, AMC airlift, channel airlift, CRAF airlift, Landing Force assets, or in-theater interservice transfers). The ULAS will be designed not to interfere with the primary functions of ROLMS. Relevant information must be extracted from the ROLMS clients prior to initiating the Daily Transaction Report in order to maintain the commander's situational awareness.

The MLC is also the point of data entry for MUREP elements M1, M2, and M3, which are not reported from ROLMS. (Data for all DoDICs are manually obtained from the Global Transportation Network, or GTN. These elements represent "future" assets, but provision must be made to capture this data in ULAS for storage management and planning, rounding out the situational awareness capabilities of the tool.)

The ROLMS-based data generated by the MLC will populate columns B, D-1, and G, and M1, M2, and M3 of the MUREP (in part), and will constitute the <u>primary</u> source of data for column E. The MLC and MARFOR will be the only organizations with authority to add values that affect column E of the MUREP, based on data that have not been reported anywhere else.

f. **Service Headquarters Staff**

The interest of the Service Headquarters staff in the MUREP is significant. At this level, the MUREP, and associated Service Component Commander's reports are less situational-oriented, and more focused on the programmatics of providing and sustaining support to the operating forces. It would be primarily used as a tool to assist in management of remaining uncommitted and wholesale stocks to optimize support to the deployed forces assigned to the supported Unified Combatant Commander. Its other likely uses are in acquisition budget defense, supporting information for Congressional inquiry, Joint Staff re-prioritization (JMPAB) actions, analyses performed by GAO, DoDIG, or Navy Audit, and other historical references.

Concept (Serv HQ): The Service Headquarters, in coordination with the Joint Staff and the supported Unified Combatant Commander, will identify items by both munition name, and where appropriate, by individual DoDIC, that may require more aggressive management attention. These designated items will become reportable items for the MUREP. The Service will also be responsible for identifying worldwide inventories of wholesale or uncommitted assets, regionally and globally.

For Theater-level MUREP input, the Service Headquarters will provide info to the Joint Staff for populating elements A, and/or B.

For the Global Readiness section of the MUREP, the Service Headquarters will provide input to the Joint Staff for elements O-1, O-5, O-6, O-7, O-8, O-9 (as applicable), and P.

Note: The values reported by the Services under the Global Readiness section of the MUREP will always differ from the Theater-level numbers identified by the supported Unified Combatant Commander. No direct relationship exists between the values in these two sections.

Appendix B – Example Unit Script for ULAS Pilot

UNIT LEVEL AMMUNITION STATUS (ULAS)

DEMONSTRATION

CAX 10-02, MCAGCC 29 PALMS

6-9 September 2002

3rd Bn, 11th Marines Playbook

1.   **Background**: Your battery is participating in an experiment to determine if the Marine Corps can establish visibility of ammunition held by the operating forces after it is issued from the Ammunition Supply Point (ASP).

2.   **Purpose**: The purpose of this test is to evaluate the equipment, processes, and procedures proposed for use by the operating forces and determine if they enable the force to improve its own situational awareness for ammunition. The Force Commander will be able to see the results of what you report during the three days of the Combined Arms Exercise within minutes of your report.

3.   **Scenario**: For the purposes of this test only, you are reporting as **3rd Battalion, 11th Marines**. Tactical operations and movement will be as directed in the CAX 10-02 Operations Order. At the times and dates designated below (or as soon thereafter as possible), you will use the ULAS equipment and this "playbook" to collect and report your ammunition status. If you have any questions about how to perform a certain procedure, refer to your ULAS User's Guide.)

4.   For all ULAS sessions, use the following User ID and Password when prompted by the system.

UserID: M113306666   **Password**: thunders

Day 0 (1000-1100, 5 Sep 2002, Classroom entered):

1. Start your ULAS.

2. Setup your *myULAS* configuration, using the methods described in the User's Guide.

3. When your *myULAS* configuration has been set, return to the Main Menu and select the Manage Status function.

4. Enter the following quantities for each item as indicated. Follow the screen commands, and refer to your User's Guide if you have questions about how to proceed.

M11330 - 3rd Bn 11th Marines		Day 0
DODIC	**NOMENCLATURE**	Initial Rcvd
D505	PROJ 155MM ILLUM	21
D528	PROJ 155MM SCRN SMK WP	38
D532	CHG PROP 155MM, RB (Z8S)	8
D533	CHG PROP 155MM, WB (Z7)	799
D544	PROJ 155MM HE	380
D563	PROJ 155MM HE-DPICM	194
N289	FUZE, ELECT TIME	371
N290	FUZE, ELECT TIME	65
N340	FUZE, PD	293
N523	PRIMER, PERCUSSION	806

5. When all items have been entered and verified, return to the Main Menu and select the Report function.

6. Review all the entries for the items on the list above. When you are satisfied that all items have been entered correctly, set up the Iridium modem and antenna following the instructions in the User's Guide.

7. Double-check all connections. If the connections are secure, send the Report.

8. When your report has been acknowledged by the system, exit from the ULAS application, power down the PED, disconnect all components, and properly stow them for next use.

9. Reporting is complete for the day.

Day 1 (0800-0900, 6 Sep 2002, Contractor-monitored):

1. Start your ULAS.

2. Use the established *myULAS* configuration, per the User's Guide.

3. Select the Manage Status function.

4. Enter the following quantities for each item as indicated.
   Follow the screen commands, and refer to your User's Guide if you
   have questions about how to proceed.

DODIC	NOMENCLATURE	Cbt Exp	Other Exp	Rcvd
M11330 - 3rd Bn 11th Marines		**Day 1 Ops**		
D505	PROJ 155MM ILLUM	4		
D528	PROJ 155MM SCRN SMK WP	6		
D532	CHG PROP 155MM, RB (Z8S)	2		
D533	CHG PROP 155MM, WB (Z7)	225		
D544	PROJ 155MM HE	110		
D563	PROJ 155MM HE-DPICM	86		
N289	FUZE, ELECT TIME	101		
N290	FUZE, ELECT TIME	19		
N340	FUZE, PD	85		
N523	PRIMER, PERCUSSION	227		

5. When all items have been entered and verified, return to the Main
   Menu and select the Report function.

6. Review all the entries for the items on the list above. When you
   are satisfied that all items have been entered correctly, set up
   the Iridium modem and antenna following the instructions in the
   User's Guide.

7. Double-check all connections. If the connections are secure,
   send the Report.

8. When your report is acknowledged by the system, exit from the
   ULAS application, power down the PED, disconnect all components,
   and stow them properly for next use.

9. Reporting is complete for the day.

Day 2 (1000-1100, 7 Sep 2002, field-entered):

1. Start your ULAS.

2. Use the established *myULAS* configuration, per the User's Guide.

3. Select the Manage Status function.

4. Enter the following quantities for each item as indicated. Follow the screen commands, and refer to your User's Guide if you have questions about how to proceed.

M11330 - 3rd Bn 11th Marines		Day 2 Ops		
DODIC	**NOMENCLATURE**	Cbt Exp	Other Exp	Rcvd
D505	PROJ 155MM ILLUM	6		
D528	PROJ 155MM SCRN SMK WP	12		8
D532	CHG PROP 155MM, RB (Z8S)	2		2
D533	CHG PROP 155MM, WB (Z7)	255		254
D544	PROJ 155MM HE	96		90
D563	PROJ 155MM HE-DPICM	76		112
N289	FUZE, ELECT TIME	145		149
N290	FUZE, ELECT TIME	16		
N340	FUZE, PD	74		69
N523	PRIMER, PERCUSSION	257		255

5. When all items have been entered and verified, return to the Main Menu and select the Report function.

6. Review all the entries for the items on the list above. When you are satisfied that all items have been entered correctly, set up the Iridium modem and antenna following the instructions in the User's Guide.

7. Double-check all connections. If the connections are secure, send the Report.

8. When your report is acknowledged by the system, exit from the ULAS application, power down the PED, disconnect all components, and properly stow them for next use.

9. Reporting is complete for the day.

Day 3 (1000-1100, 8 Sep 2002, field-entered):

1. Start your ULAS.

2. Use the established *myULAS* configuration, per the User's Guide.

3. Select the Manage Status function.

4. Enter the following quantities for each item as indicated. Follow the screen commands, and refer to your User's Guide if you have questions about how to proceed.

M11330 - 3rd Bn 11th Marines		Day 3 Ops		
DODIC	**NOMENCLATURE**	Cbt Exp	Other Exp	Rcvd
D505	PROJ 155MM ILLUM	10		
D528	PROJ 155MM SCRN SMK WP	16		
D532	CHG PROP 155MM, RB (Z8S)	3		
D533	CHG PROP 155MM, WB (Z7)	234		
D544	PROJ 155MM HE	108		
D563	PROJ 155MM HE-DPICM	122		
N289	FUZE, ELECT TIME	113		
N290	FUZE, ELECT TIME	18		
N340	FUZE, PD	83		
N523	PRIMER, PERCUSSION	238		

5. When all items have been entered and verified, return to the Main Menu and select the Report function.

6. Review all the entries for the items on the list above. When you are satisfied that all items have been entered correctly, set up the Iridium modem and antenna following the instructions in the User's Guide.

7. Double-check all connections. If the connections are secure, send the Report.

8. When your report is acknowledged by the system, exit from the ULAS application, power down the PED, disconnect all components, and properly stow them for next use.

9. Reporting is complete for the ULAS test.

Appendix C – ULAS Sample Screenshots

1. The following are a series of screenshots of the screens used within the ULAS environment, both on the PED platform, and the web-user's interface.

2. These screens supported the ULAS environment on the PED, providing the user with methods for accessing and starting the application, configuring the application for the user's local need, recording of transactional data, and finally, reporting of those accumulated data.
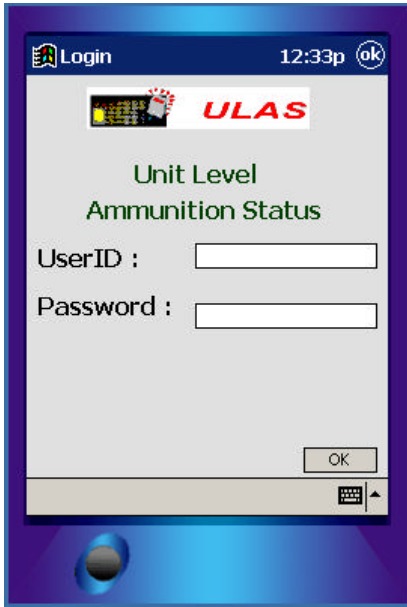
Figure 12: Login Screen
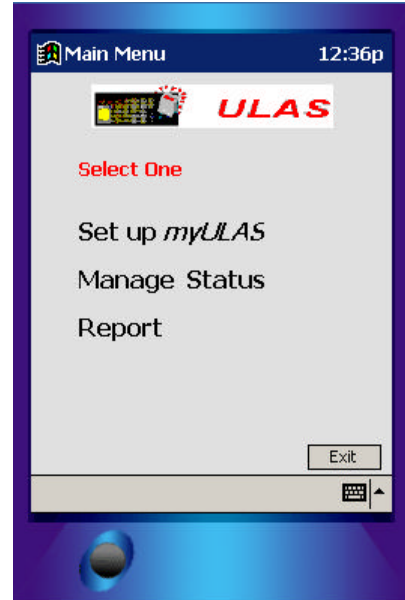
Figure 13: Main Menu
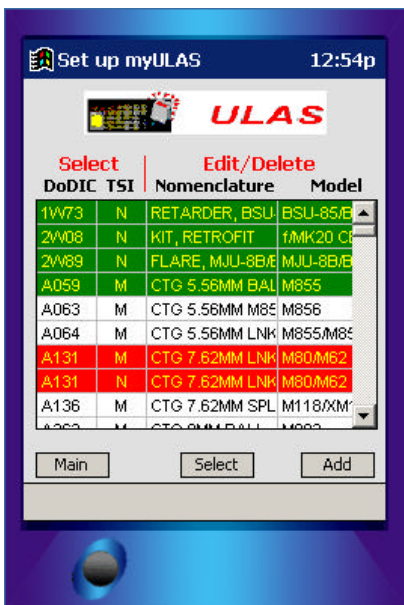
Figure 14: Configuring *myULAS*
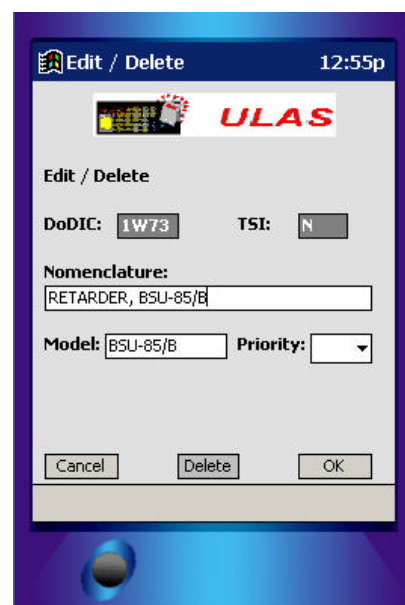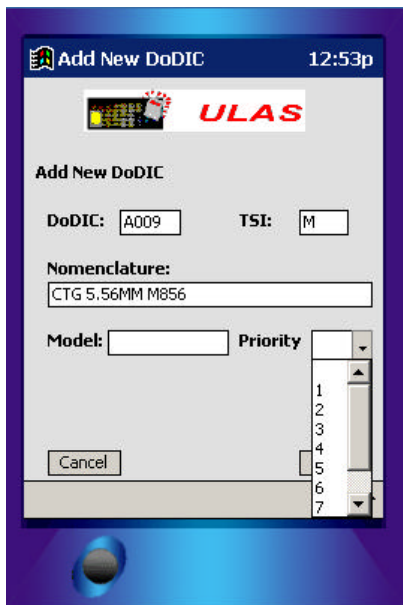
Figure 15: Edit DoDIC Data
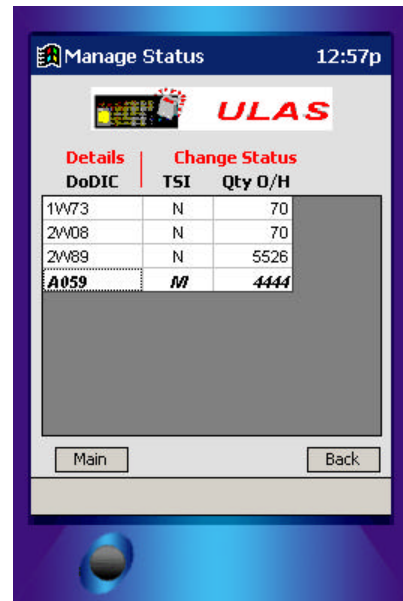
Figure 16: Adding A DoDIC
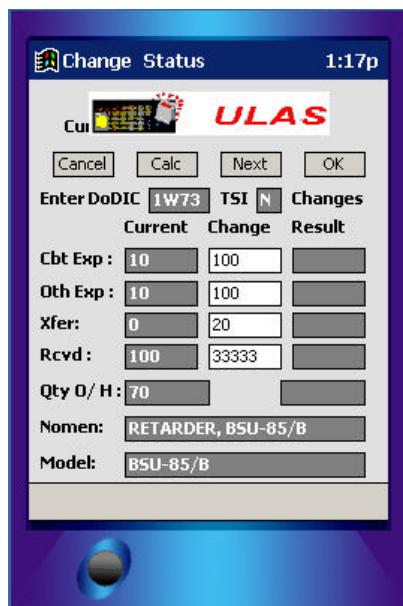
Figure 17: Reviewing Current Status
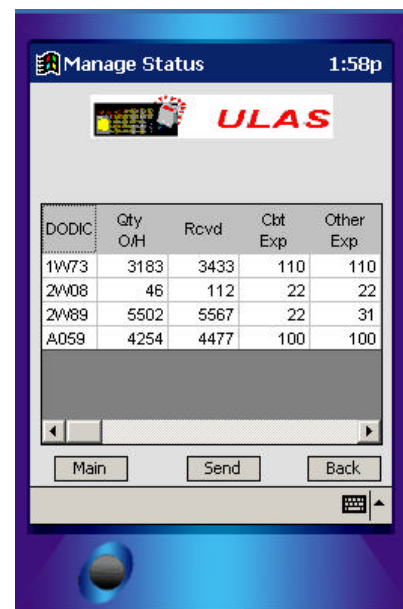
Figure 18: Changing Status

Figure 19: Values For Reporting

3. The next set of screen shots are extracted from the ULAS web site and illustrate how the application was presented to the user community. The screen shots presented are predominantly from the MARFOR level, illustrating the range of menu options available. Subordinate organizations will have progressively fewer menu options, based on their respective need.

Figure 20: Welcome Screen

Figure 21: Setup *myULAS*

Figure 22: Enter Expenditure/Receipt Data

Figure 23: Consolidated Transaction Data

Figure 24: List Reports of First Tier Subordinates

Figure 25: Using the Dropdown List

Figure 26: MEF-level Subordinate Report

Figure 27: CSSD View

Figure 28: Mobile CSS Data
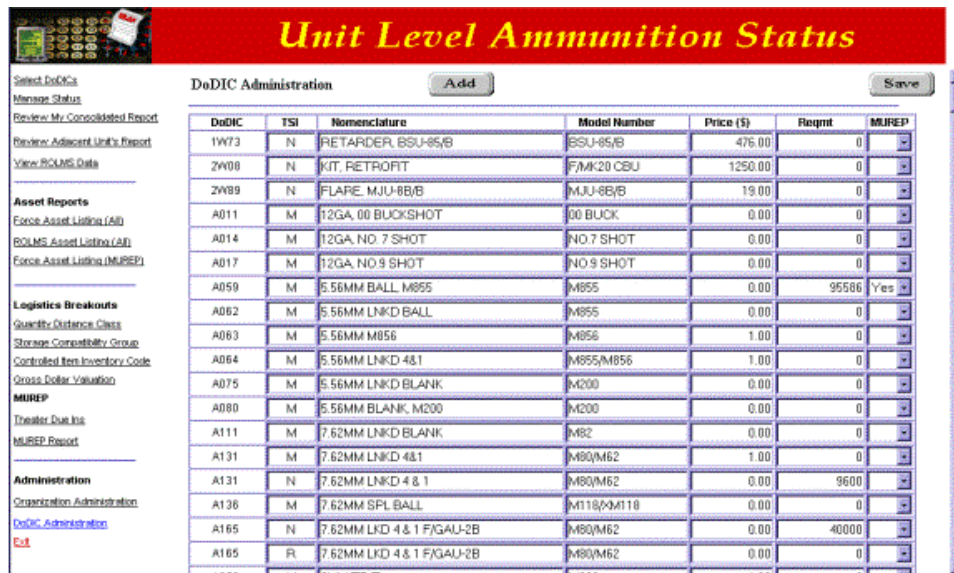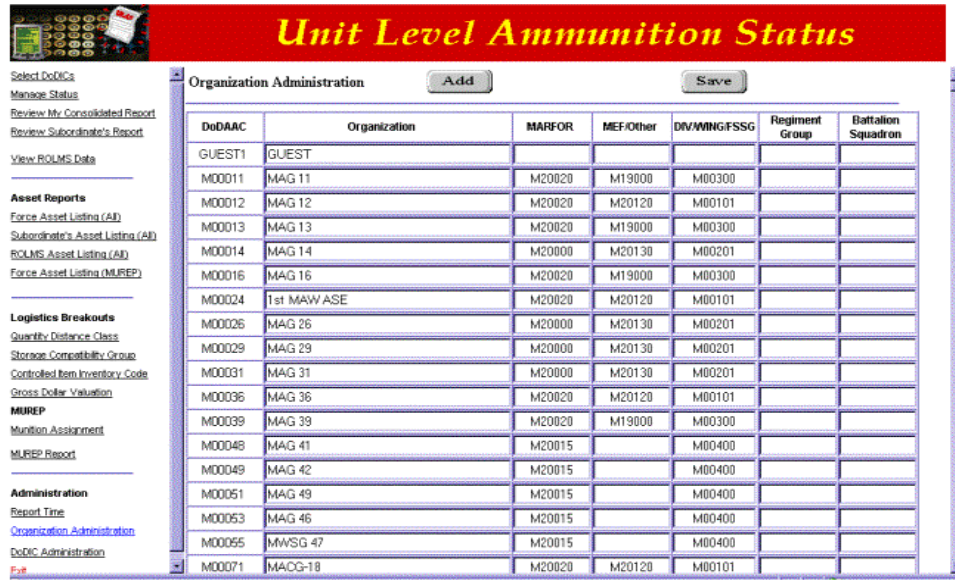
Figure 29: DoDIC Administration Page
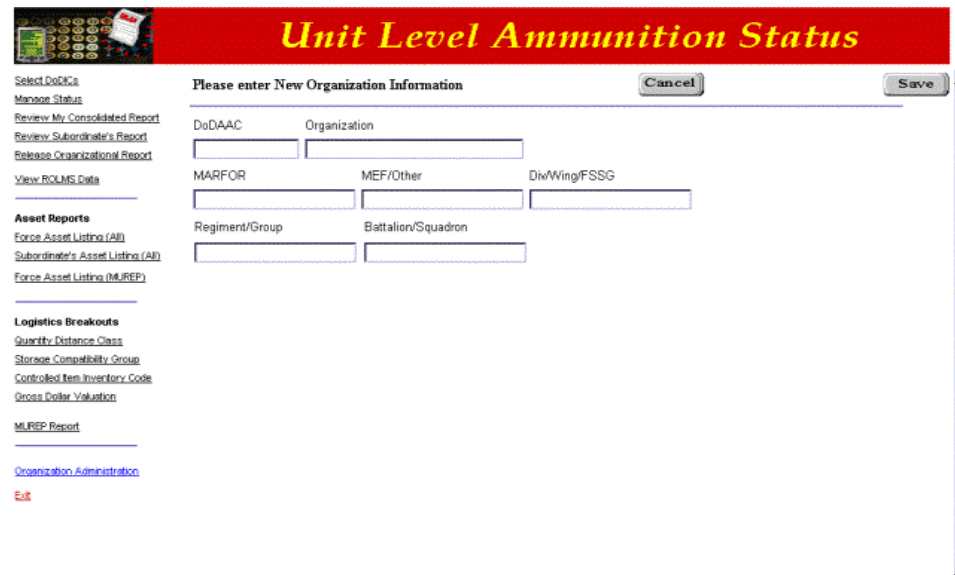
Figure 30: Organization Administration Page

Figure 31: Organization Data Page

Appendix D – ULAS Installation Procedures

System Requirements

1.   Since the ULAS is designed for two types of users, the system requirements are slightly different.

   a.   For organizations with non-reporting subordinates, the Portable Electronic Device (PED) is the primary mode for collecting and reporting the unit's data. This device is equipped with the Pocket PC 2002 operating system, and a SQL Server CE database. The ULAS application is installed by creating an ActiveSync connection with a laptop computer and replicating the ULAS application onto the PED, along with the security credentials for the unit. The PED is now ready for use.

   b.   For organizations that predominantly access ULAS functions through the web browser interface, no client software is required. All that is required is a laptop/desktop computer capable of operating the Internet Explorer, version 5.5, or later. (If this laptop/desktop computer will also be used to activate subordinate unit PED, a copy of the current version of Microsoft ActiveSync will also be required, as well as an unoccupied serial, or USB port.)

2.   The web server and application server setups are unremarkable server configurations. The web server uses Windows 2000 Advancer Server operating system and Internet Information Server. The application and database server also used the Windows 2000 Advancer Server operating system, joined with SQL Server 2000, and the ULAS database. The web server was installed within the contractor's network demilitarized zone (DMZ), and access was controlled through the use of Secure Socket Layer (SSL) technology, and user authentication. The application/database server was installed behind the contractor's firewall for security.

Appendix E – Acronyms and Terms Used in ULAS

ALFT	Ammo Logistics Focus Team
ASP	Ammunition Supply Point
CAX	Combined Arms Exercise
CE	Command Element
CINC	Commander-in-Chief (President of the United States, (POTUS), term formerly included the Unified Combatant Commanders)
CJCSM	Chairman of the Joint Chiefs of Staff Manual
CSS	Combat Service Support
CU	Non-standardized term representing "combat usable"
DoD	Department of Defense
DoDAAC	Department of Defense Activity Address Code
DoDIC	Department of Defense Identification Code
DOS	Days of Supply (per the modified MUREP format. Used synonymously with *Days of Ammunition (DOA)*)
GCSS	Global Combat Support System
GCSS-MC	Global Combat Support System – Marine Corps
JS, JCS	Joint Staff, Joint Chiefs of Staff
LTA	Limited Technical Assessment
MAGTF-TC	Marine Air-Ground Task Force Training Center
MARFOR	Marine Force component headquarters
MCAGCC	Marine Corps Air Ground Combat Center
MEC	Marine Forces Pacific Experimentation Center
MEC-ALFT	MFP Experimentation Center – Ammo Logistics Focus Team
MEF	Marine Expeditionary Force
MSC	Major Subordinate Command
MUREP	Joint Munitions Status Report
OCE	Officer Conducting the Exercise
PDA	Personal Digital Assistant
PED	Portable Electronic Device. *See also PDA.*
ROLMS	Retail Ordnance Logistics Management System
SBL	Sea-based Logistics
TAV	Total Asset Visibility/Theater Asset Visibility
tcp/ip	transmission control protocol/internet protocol
ULAS	Unit Level Ammunition Status